REMARKS

Pending Claims

Claims 1-6 and 73-78 are pending. Claims 7-72 and 79-144 are withdrawn from consideration. Claims 1, 4, 73, and 76 have been amended. No new matter is added.

Rejections under 35 U.S.C. § 112, Second Paragraph

Claims 1 and 73 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Specifically, the Examiner states that the phrases "propagation time of radio signals between the two radio stations and the radio terminal" and "specifying a communication range of at least one of the two radio stations to determine the candidate point included in the communication range of the two candidate points" are unclear.

The phrase "propagation time of radio signals between the two radio stations and the radio terminal" has been amended to clarify that "distance values for calculating the hyperbola and the at least one circle are based on propagation times of radio signals between the two radio stations and the radio terminal." For example, page 40, lines 1-13 of the originally-filed specification describes how distances can be determined based on propagation times of signals between two radio stations and a radio terminal.

With regard to the phrase "specifying a communication range of at least one of the two radio stations to determine the candidate point included in the communication range of the two candidate points," the Examiner specifically cited to the expression "communication range" as being unclear. As discussed for example in the paragraph spanning pages 28-29 of the originally-filed specification, the base stations form a plurality of communication areas referred to as sectors. Thus, the expression "communication range" has been amended in claims 1, 4, 73, and 76 to recite "communication sector" in order to clarify the claimed invention.

No new matter has been added by the amendments.

Claims 1-6 and 73-78 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Keränen et al. (2002/0094820). However, in light of the amendments and arguments presented herein, Applicant respectfully submits that the rejection is traversed. Applicant reserves the right to present additional reasons why the claims are patentable.

Claim 1 as amended recites "calculating a hyperbola and at least one circle" and determining the two points where these curves intersect, the intersection points representing two possible locations of the terminal. The distance values for calculating the hyperbola and the at least one circle are based on propagation times of radio signals between the two radio stations and the radio terminal. In one embodiment, the hyperbola is calculated based on the difference in the distance between the terminal and each of the radio stations, which difference can be determined based on the difference in reception time at the terminal of synchronized pilot signals sent from each of the radio stations. Finally, to ascertain which of the two intersection points represents the location of the terminal, the communication range of at least one of the two radio stations is specified to determine which of the two points is within the communication range, that point representing the location of the terminal.

Keränen relates to base station positioning in a mobile network having plural Radio Network Subsystems (RNSs) composed of plural Node Bs and Radio Network Controllers (RNCs). Keränen discloses (paragraphs 32-33 on pages 3-4) that the distance of the user equipment (corresponding to the "terminal" in the present application, hereinafter called terminal) from a Node B may be determined by using the propagation time between the plural Node Bs and the terminal, and furthermore that the position of the terminal may be determined by calculating the intersection of circles, wherein the radii of the circles are the distance of the terminal from the plural Node Bs. However, the system disclosed in Keränen requires measurement of the distance between at least three Node Bs and the terminal, and subsequent calculation of the intersection of three circles in order to determine the position of the terminal. See paragraph 33 on page 3 of Keränen.

Furthermore, in paragraphs 42-43 on page 4 of Keränen, the location methods observed time difference on arrival (OTDOA) and observed time of arrival (OTOA) use the determination of the propagation times between at least three Node Bs and the terminal. In addition, the angle

of arrival (AOA) method uses the distance between one or two Node Bs and the terminal along with angle of arrival of signals sent from terminal to the connected Node B. See paragraphs 42-43 on page 4 of Keränen.

In comparison, the present application discloses the terminal location specification system using sector information of the connected radio station (corresponding to Node B in Keränen) and the propagation time between the terminal and two radio stations (also corresponding to the Node Bs in Keränen). This terminal location specification system is different from any base station positioning system disclosed in Keränen. In the Background of the Invention section, Keränen refers to GPS-assisted methods of location as being undesirable (paragraph 7 on page 1) because the GPS unit adds bulk and cost to the terminal. However, Keränen does not describe or suggest a termination location system which combines radio stations in a mobile network with GPS satellite. In this respect, the Keränen reference is different from the present application.

In addition, Keränen describes a system for determining a location of a terminal which requires calculating two circles, which in turn requires knowing the distance between the terminal and each of the radio stations. The distance from the terminal to a radio station is determined using the round-trip time (RTT) of a signal traveling between the terminal and radio station, and thus determining the RTT requires two-way communication between the terminal and the radio station. Therefore, the methods of Keränen, which involve calculating the distance between the terminal and two radio stations, requires that the terminal be in two-way communication with at least two radio stations so as to be able to calculate RTTs between each of the radio stations. In the example of paragraph 43 on page 4 of Keränen, in which the distance from the terminal to only one radio station is known, Keränen notes that the location of the terminal can only be determined within a particular sector. See Fig. 6 of Keränen. As noted in paragraph 0043 of Keränen, a sector may cover 120 degrees of the area around an antenna, which means that the location of a terminal cannot be determined very accurately with the techniques of Keränen.

On the other hand, to perform the method of claim 1 or to use the system of claim 73 it is sufficient that the terminal be in two-way communication with only one of the radio stations in order to calculate the radius of one circle. To obtain the information to calculate the hyperbola in

a particular embodiment, the method of claim 1 and the system of claim 73 require only that the terminal be able to receive pilot signals from two radio stations. From the difference in arrival times of the pilot signals, the terminal can then calculate the difference in distance of the terminal from one radio station relative to the other. Thus, the claimed invention offers an improved way to determine the location of a terminal relative to two radio stations.

The remaining claims are allowable at least because each depends from an allowable independent claim.

CONCLUSION

In view of the remarks and amendments presented herein, reconsideration and withdrawal of the pending rejections and allowance of the claims are respectfully requested. The Examiner is strongly encouraged to contact the undersigned at the phone number below should any issues remain with respect to the application.

No fees are believed due in connection with this response. However if any fees are owed, please charge such fees to Deposit Account No. 50-1965.

Respectfully submitted,

/thomas j. keating/

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